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Fuel Rationing

The Government's proposals to ensure a more equitable distribution of fuel were outlined by Sir Stafford Cripps last week. It appears that for some time industry has made applications based on calculated requirements and against these allocations have been made. These allocations rarely equalled the demand. The new plan is to give all that is necessary to keep the power stations and gasworks running to the maximum of the output capacity. The domestic allocations are not to be altered, but for the next six weeks or so, it seems that industry is to bear the brunt of the cuts. Every firm, it appears, will have the statutory allowance of 50 per cent. of its former allocation of solid fuel. Those firms, however, which are deemed to be of national importance will get an additional allocation depending on (*a*) the quantity of fuel locally available, and (*b*) the acceptance of the plea of " national importance " by the district fuel allocation committee. As its very name indicates, the foundry industry is " fundamental "; its plea for special consideration is incontrovertible, but local committees have to be convinced of this. Here, co-operation is essential and any foundry concern which believes it has a " raw deal " should immediately get into touch with its appropriate employers' federation.

The crisis, which every businessman anticipated, arrived earlier than the Whitehall pundits expected, and is probably more severe than was estimated. However, Sir Stafford Cripps expects that it will only last about six weeks, and that short-time working, but no total unemployment, will result. Many trades, dependent entirely on electricity for power, will be unaffected except by those annoying and potentially dangerous daily cuts. It appears that it is the domestic load which has overburdened the power stations. This comes as no surprise to us, as before the war was ended we were inundated with enquiries for castings for electrical gadgets, and it was not long before recognised manufacturers were telling us that a ridiculous over-production was being demanded. When on holiday near the Lake district, every village ironmongery and radio shop was over-stocked with domestic electrical apparatus. As the housing programme is likely to develop more quickly than the provision of additional generating capacity, we envisage a progressive deterioration in the reliability of the supply of electric current. A serious factor in the difficulty of electricity supply is, we suspect, the deterioration of the quality of the fuel received by the power stations. The cardinal factor, so far as the ironfoundries are concerned, will be the delivery of coal to the coke ovens. On this particular point, enquiries at the various Ministries have yielded a blank. However, as foundry coke is not everybody's meat, and a meeting of local founders should be able to arrange with the district fuel board equitable distribution of the available supplies. Every ton of the coke failing to reach the ironfoundry means a loss of production of about 17 or 18 tons of castings.

The British Iron and Steel Federation have reported that the industries they embrace are to be subject to a solid fuel cut of 25 per cent. If this is applicable to foundry coke, then the weekly reduction in output will be of the order of 13,500 tons. It will be obvious to everybody within the industry that a reduction of this character will have a profound effect on the economy of the country. Another section bound to suffer will be the non-ferrous foundries using the coke-fired crucible process. Here the overall effect will not be so serious, as many concerns are already using other types of fuel. It is to be hoped that there will be no serious interference with the industries supplying all those types of foundry requisites which are now in such short supply, such as moulders' and patternmakers' tools.

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FORTHCOMING EVENTS

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

JANUARY 24.

Institution of Mechanical Engineers:—"Materials New to Engineering," by F. T. Barwell and J. C. W. Humphrey. At the Institution, Storey's Gate, London, S.W.1, at 5.30 p.m.

Manchester Association of Engineers:—Industrial Films. At the Midland Hotel, Manchester, at 5.45 p.m.

JANUARY 27.

Royal Statistical Society—Industrial Applications section (Sheffield group):—"Statistics Applied in a Bar Rolling Mill," by W. T. Hale. At Room B.1, Department of Mechanical Engineering, The University, St. George's Square, Sheffield, 1, at 6.30 p.m.

JANUARY 28.

Association of Bronze and Brass Founders (Lancashire and Cheshire area):—Informal meeting. At the Midland Hotel, Manchester, at 2.30 p.m.

JANUARY 30.

Institute of Vitreous Enamellers:—Quarterly meeting in London. (Details to be found elsewhere in this issue.)

JANUARY 31.

Royal Statistical Society—Industrial Applications section (London group):—"Control Charts Applied to Sales Data," by Dr. B. P. Dudding. At E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, at 6 p.m.

FEBRUARY 1.

Institute of Physics (South Wales branch):—"Some Applications of Calculating Machines," by Dr. L. J. Comrie. At University College, Cardiff, at 3 p.m.

Institute of British Foundrymen

JANUARY 25.

London branch:—"Broad Aspects of Pattern-making, with Especial Reference to a New Machine Development," by B. Levy. At the Waldorf Hotel, London, W.C.2, at 2.30 p.m.

CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

SIGNIFICANCE OF "CHILL MOULDS"

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—In your article "A Review of 1946" in the FOUNDRY TRADE JOURNAL dated January 9, 1947, reference is made to the production of grey-iron castings by the Eaton-Erb process, using chill moulds. The term "chill mould" gives one the impression that castings made by this process are chilled and consequently hard, whereas in actual fact, they are softer and more easily machined than normal sand castings. As a matter of fact, most users of ferrous die castings have increased their machining speeds from 15 to 20 per cent., with consequent less down time for re-sharpening and re-setting tools.

Dies used in this process are designed to avoid chilling and, in addition, a refractory coating is applied to all parts which are liable to come into contact with molten iron. This refractofy coating acts as an insulator and controls the cooling rate of the casting.

Yours, etc.,

H. A. REDSHAW.

Qualcast, Limited,
Derby,
January 17, 1947.

NOTES FROM THE BRANCHES

WALES AND MONMOUTH.—Members recently visited the steelfoundry of A. Hamilton & Sons, Limited, East Moors, Cardiff, where they were met by Mr. A. Hamilton and Mr. R. Hamilton, who, with the assistance of members of their staff, conducted the party around the works. Before leaving, a hearty vote of thanks was accorded the firm for affording the opportunity of viewing their foundry and observing their methods of producing steel castings. Replying, Mr. A. Hamilton expressed the opinion that there was something of interest in every foundry to another foundryman. If they had observed anything of special interest, he was as pleased as they were, and any individual member of the party would be a welcome visitor at any time.

The company later assembled at the Engineers' Institute, where tea was served, prior to the presentation of a Paper by Mr. L. W. Sanders, of Lake & Elliot, Limited, Braintree, Essex, who was supported by Mr. Hardy, his co-Author. The Paper covered the entire ground of steel casting production, and was illustrated by a series of slides showing every process involved.

A discussion followed with many questions, all of which were dealt with by Mr. Hardy or Mr. Sanders to the entire satisfaction of the meeting. In moving a vote of thanks to the Authors, Mr. R. J. Richardson described the lecture as an illuminating talk embracing all the foundry practice in the making of steel castings and the data set out in the charts shown were particularly interesting and valuable. Mr. F. Bowman seconded the vote of thanks, which was carried with acclamation.

Mr. Hardy and Mr. Sanders acknowledged briefly, and expressed satisfaction at the reception accorded their effort by the meeting.

TUMMEL GARRY SCHEME

For the Errochty power station in the Tummel Garry scheme, forming one of the most important parts of the general project, the North of Scotland Hydro-Electric Board has placed a contract with the General Electric Company, Limited, for the manufacture and installation of three vertical-shaft water turbo-alternators with turbines of Böving manufacture. Each alternator will have an output of 27.800 kVA. M.C.R. at 11,000 volts, and the Böving turbines, a specified rating of 35,000 h.p. against a 525-ft. head of water.

It is of interest to note that as much of the plant as possible will be made in Scotland, where the water turbines will be built and all the heavy forgings for the alternators produced. The electrical equipment will be manufactured throughout the G.E.C. engineering works at Witton.

Merz & McLellan, of London, are the consultants for this scheme and it is hoped to complete the installation for the winter load of 1948.

MALLEABLE CAST IRON*

By H. G. HALL, F.I.M.†

(*Continued from page 57.*)

Second Stage

Stage 2 demands that the temperature be maintained until all free cementite has been absorbed by the austenite solution. The prime factor governing this operation is furnace atmosphere and the gas phase surrounding the material. It is not only in the metal that the urge exists to attain equilibrium; but also between the metal and the gas phase surrounding it. In the orthodox annealing oven this gas phase is a product of the reaction between the packing (if packing be used) and the metal, plus the products of combustion of the fuel used for heating.

No amount of luting of the containers will prevent the products of combustion circulating, so some extent, inside the containers—it can only prevent flame impingement. It is still a question of graphitisation only, and a necessary control for the promotion of rapid graphitisation and speedy annealing, is that substantial decarburisation shall be avoided. The reasons demanding minimum decarburisation, mainly relate to stage 4—cooling through the critical range—and will be dealt with later. If, therefore, the oven atmosphere contains oxygen, the gas phase will contain CO_2 and CO in definite and predictable proportions, determined by its having saturated itself with carbon from the iron. A free supply of oxygen in the shape of a constantly oxidising furnace atmosphere will, therefore, promote decarburisation. Reference has been made to hydrogen as retarding graphitisation, and it may be added that moist hydrogen being a most active decarburising agent, moisture in the furnace atmosphere should be avoided.

On the other hand, mixtures of CO_2 and CO can accelerate graphitisation.[8] In practice, this holding stage is prolonged well beyond the actual time necessary to eliminate cementite in the normal large batch ovens, especially if packing material be used. Some idea of this may be obtained from the following figures of the time necessary to eliminate free cementite, in laboratory tests at various temperatures.

15 mins. at 1,050 deg. C.;
or 6 hrs. at 1,000 deg. C.;
or 24 hrs. at 900 deg. C.;
or 50 hrs. at 860 deg. C.,

and an extreme example, quoted by Schwartz,[9] 73 days at around 720 deg. C. A strong theoretical case therefore exists for the use of furnaces with positively controlled atmospheres.

Third Stage

Cooling from the predetermined temperature, to just above the critical point, is generally regarded as of no particular significance, the general idea being that the stage be accomplished as quickly as possible. However, if substantial decarburisation has occurred, resulting in a surface layer of low carbon content, then an overall saving of time may be effected by a slow rate of cooling to just above the critical point. In theory, a levelling of the carbon content gradient should be obtained plus easier graphitisation during stage 4.

Fourth Stage

Just above the critical point, at about 730 deg. C., the structure consists of saturated austenite containing about 0.6 per cent. carbon and graphite nodules. This

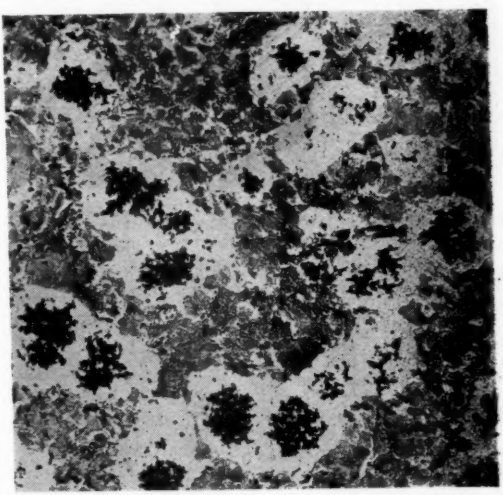

FIG. 12.—"BULLS-EYE" STRUCTURE CAUSED BY TOO RAPID COOLING THROUGH CRITICAL RANGE. (× 60.)

austenite is approaching eutectoid composition. When holding at a temperature just under the critical range, the cementite of the pearlite is spheroidised,[10] and in time decomposed into ferrite (alpha iron), and graphite. In this old established orthodox procedure, the fact which dominates this stage, is the degree of decarburisation which has previously occurred, and the relation, in time, of this decarburisation and graphitisation.

It is generally accepted that if the carbon content at the surface of the metal has been substantially reduced during the first three stages, then cooling at the accepted rate of 50 deg. C. per hour through the critical range, produces a material with a normal and com-

* A Paper presented to the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen.
† Director, Castings, Limited, Walsall.

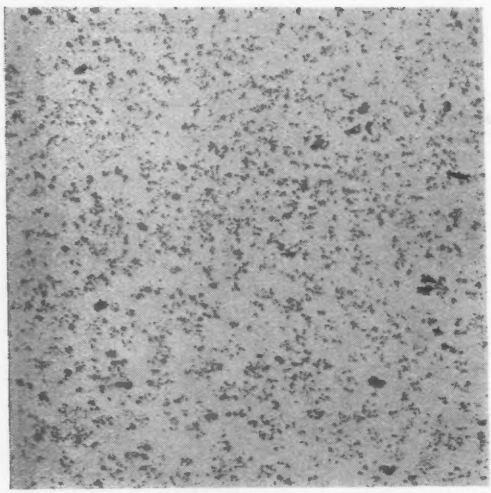

FIG. 13.—PREQUENCHED AND FULLY ANNEALED. (× 60.)

pletely graphitised centre, but with a layer of pearlite at or just under the surface, the metal known as " picture frame " blackheart.

If the amount of decarburisation has been substantial, and the carbon content of the surface layer lowered appreciably, the time necessary to complete graphitisation and eliminate pearlite becomes so long as to be commercially impracticable. What are the reasons for this? Whether the Rehder theory[11] about the oxidation of silicon and its retarding effect on graphitisation be correct or not, fundamentally, it is the stage at which decarburisation occurs which governs the stability of the pearlite rim. Speed of migration of carbon in solution in iron, is of the highest importance, and the more numerous the nodules, the shorter the time required for graphitisation. Consider then, the case of a surface layer in which there are no nodules present, and it is obvious that the carbon in this layer must travel a long way before it can reach nodules, on which it can deposit as graphite. If, however, nucleisation occurs before decarburisation, then substantial decarburisation can follow, without necessarily producing a pearlite rim and without the need for greatly increased time in cooling through the critical range.

Graphite is much more difficult to remove by oxidation than carbon in solid solution, and provided that there are nodules, or even the skeletons of nodules, present in the surface layers during the cooling through the critical range, then the carbon in solution, even though the content may be very low, can deposit on these. The Author would like to stress the fact that the rate of nucleisation is affected by the base pig-iron used, and that normal analytical methods have provided no clue to the reason. It is also noteworthy that there is an American Patent,[12] which, based on the fact that substantially decarburised metal requires greatly increased time to affect complete graphitisation, requires that stage 1 and part of stage 2 be conducted in a carburising gas atmosphere, in order to prevent decarburisation entirely, thereby obtaining a considerable reduction of total annealing time. Figs. 12 to 15 will clarify these comments.

It is pertinent to refer to some illustrations shown by Dr. Hurst, in his recent presidential address to the Staffordshire Iron & Steel Institute. They represent two micrstructures of two irons of very similar analysis, but produced from two different British hematite pig-irons. These irons were annealed side by side in the same container. When fractured after annealing, the one showed a fairly typical blackheart fracture and the other a fairly typical whiteheart fracture. The microstructures confirm the visual fracture; that produced from pig-iron A being entirely ferrite and graphite, and that from pig-iron B (annealed in the same container) having considerable pearlite in the matrix. This difference in annealability was not an isolated example, the same difference occurring in iron made from pig-iron A and B over many weeks. To confirm the above, samples of white cast iron of widely varying compositions, melted in many different types of furnaces, but from pig-irons A, B and C were obtained from several malleable ironfounders. These were all annealed together in one container. The similarity of

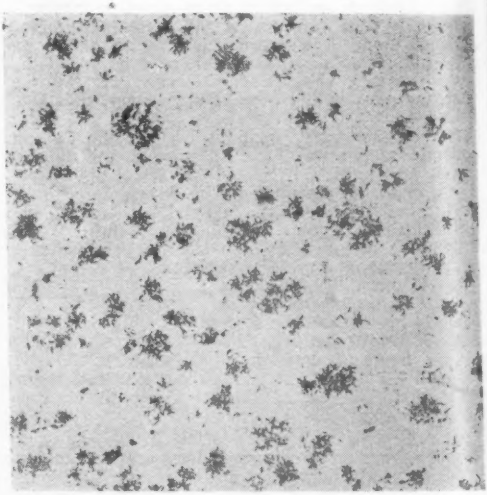

FIG. 14.—FULLY ANNEALED. (× 60.)

the structure produced from one brand of hematite, in spite of the different melting techniques employed, was very obvious. (See Figs. 16 to 19.)

TABLE. 1—*Complete Analysis of the Two Samples of Malleable Iron.*

	Pig-iron A. Dull black desirable fracture. Per cent.	Pig-iron B. Bright crystalline fracture. Per cent.
Total carbon	0.93	0.89
Silicon	0.38	0.40
Sulphur	0.100	0.110
Phosphorus	0.086	0.086
Manganese	0.31	0.36
Nickel	0.01	0.01
Chromium	0.02	0.02
Molybdenum ..	0.01	0.01
Vanadium	0.01	0.01
Titanium	0.04	0.02
Copper	0.02	0.02
Aluminium	0.04	0.10
Tellurium	Nil	Nil
Boron	Nil	Nil
Calcium	0.005	0.005
Other metals ..	Absent	Absent
Gases		
Oxygen	0.0050	0 0062
Nitrogen	0.0070	0.0105
Hydrogen	2.08 mls. per 100 gms.	2.26 mls. per 100 gms.

Table I compares the analyses of the annealed samples made from pig-irons A and B. Dr. Hurst kindly supplied them and they are very complete—even to gas content. Yet in spite of the thoroughness with which these samples have been investigated, the results

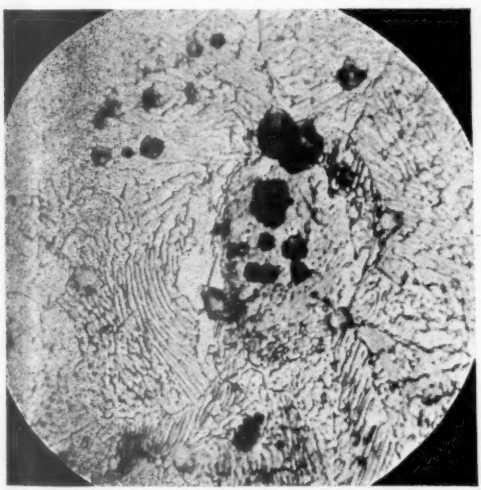

FIG. 15.—UNBALANCED SULPHUR COMPOSITION AFTER PREQUENCH AND ANNEALING. (× 2,000.)

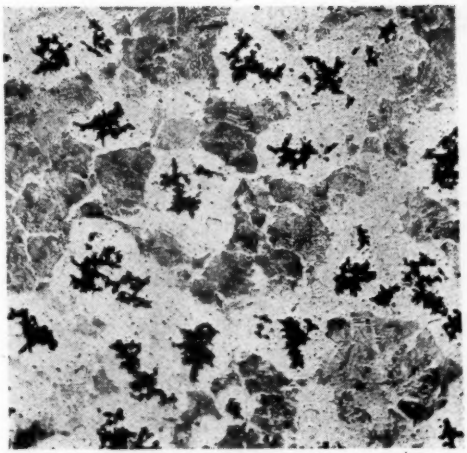

FIG. 16.—CENTRE OF THICK BASE PIG-IRON B. (× 60.)

do not adequately explain why the rates of graphitisation have so obviously differed. Orthodox whiteheart, as already shown, contains insufficient manganese to balance the sulphur, which is, therefore, present as iron sulphide. The characteristic of such iron after annealing is the spheroidal type of graphite nodule.

The decarburisation of such irons has been the subject of many investigations, and it is now generally accepted that the process was a gaseous one—a fact realised in 1908 when Wüst was granted a patent for malleablising with the aid of gas. More recently Baukloh and his co-workers[13] have definitely confirmed that the decarburisation of malleable iron takes place at the surface of the metal, and the process is maintained by diffusion of carbon from the interior to the surface. The composition of the gas phase in the container with iron ore packing has been studied, and it seems that the main components are carbon monoxide and carbon dioxide in the ratio of roughly 70:30. It has also been demonstrated that the castings and ore need not be in contact for decarburisation to occur.

Carbon dioxide is thus the main oxidising agent present in the iron ore type annealing, and is initially produced by reaction between the entrapped air in the container and the carbon at the surface of the metal. The CO_2 so produced, reacts with the iron carbide in solution at the surface to produce carbon monoxide, which is then regenerated by the oxygen of the ore, according to the main equilibrium reaction $Fe_3O_4+CO=3FeO+CO_2$ and so produces CO_2 again. The process is, therefore continuous so long as there is sufficient oxygen in the ore or sufficient carbon at the surface of the casting. The process itself consists of raising the castings to a predetermined temperature; the castings

Malleable Cast Iron

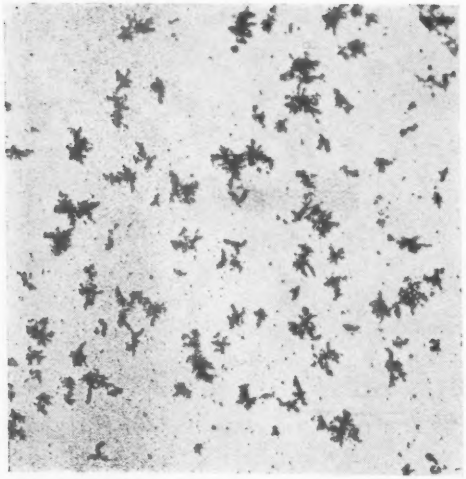

FIG. 17.—CENTRE OF THICK-SECTION BASE PIG-IRON A. (× 60.)

having been packed in a suitable mixture of new and used ore.

At the predetermined temperature, the structure, similar to the case of iron suitable for graphitisation, consists of austenite attempting to dissolve free cementite to reach its saturation limit or equilibrium, and at the same time precipitating free graphite. The carbon in the austenite solution at the surface is being continuously removed by reactions with carbon dioxide. The austenite solid solution at the surface, therefore becomes impoverished and will dissolve free cementite to maintain its saturation, until all free cementite has been used up. The austenite at the centre then dissolves more cementite and migrates towards the edge to maintain equilibrium, and finally when all cementite has been eliminated, the impoverished austenite solution will attempt to re-dissolve the already precipitated graphite in its effort to maintain equilibrium.

This last stage proceeds much more slowly, a fact indicated by the very different curves of carbon content, from surface to centre shown in Fig. 11. When carbon removal has proceeded to a sufficient degree the oven is allowed to cool naturally to about 600 deg. C. before opening. It must be evident from the above description that the speed of decarburisation in gaseous atmospheres, is largely governed by the rate of diffusion of carbon, or the speed at which the carbides in solution migrate from the centre to the surface.

The most important factor in this process is the rate of migration of carbon in solution in iron, governed by: (*a*) the rate of solution of cementite, and (b) the precipitation of graphite. From previous comments, it would seem that the rate of heating to a predetermined temperature should be as fast as is practicable to avoid nucleisation and consequent graphite precipitation. Here, however, in the case of irons containing only iron sulphide, knowledge of nucleisation is even more scanty than in the case of irons containing manganese sulphide. It is extraordinarily difficult to assess the number of nodules per unit area in a metal such as whiteheart, where a slight difference in position between surface and centre may present a widely different structure.

Certainly there is some similarity, in that a prequench treatment given to the iron sulphide type iron again produces, on subsequent annealing, an enormous increase in the number of nodules. No evidence presented so far suggests that the type of gas phase surrounding the iron sulphide type irons affects in any way the nodule number, as may be the case in the manganese sulphide irons.

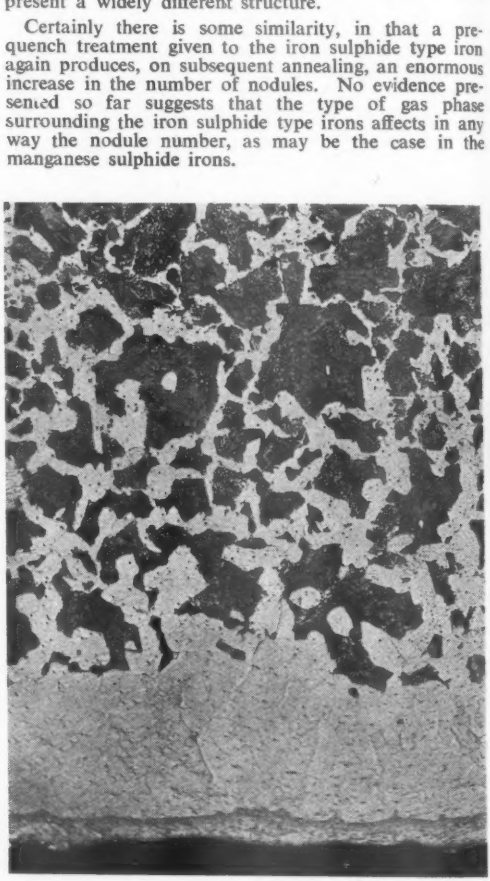

FIG. 18.—EDGE OF THIN-SECTION BASE PIG-IRON B. (× 60.)

A fact, which may have a bearing on the nucleisation of the iron sulphide irons,[2] is, that owing to the reversibility of the reactions $FeS + Mn \rightleftharpoons MnS + Fe$ an iron, the structure of which shows iron sulphide in the as-cast state, may not show iron sulphide at the annealing temperature, owing to the solubility of solid iron sulphide in solid manganese sulphide. This solubility increases rapidly with increasing temperature.

This fact has, perhaps, not received the attention it deserves in research on whiteheart malleable iron; it seems feasible that the rate of solubility of iron sulphide in manganese sulphide may have an important bearing on the rate of heating to temperature and graphite nucleisation.

Future research workers new to malleable may be warned against introducing cold specimens into a furnace already at the predetermined temperature. Their conclusions, both relating to graphitisation and decarburisation, would be open to grave suspicion. Practical, rather than theoretical, considerations, determine the choice of annealing temperature—distortion—the high cost of high temperatures, oven maintenance, pot or can life, sintering of ore on castings; the usual compromise is a temperature near 1,000 deg. C.

FIG. 19.—EDGE OF THIN-SECTION BASE PIG-IRON A. (× 60.)

Assume, therefore, that castings of the iron sulphide type packed in suitable ore mixture have reached 1,000 deg. C. The important factor now is the solution rate of cementite, size of section, and pouring temperature. The last two items are frequently lost sight of. The solution rate of cementite in austenite is much retarded by the presence of iron sulphide. No entirely convincing reasons for this are as yet known, one plausible theory suggests that the iron sulphide compound forms films around the carbide particles,[4] thus creating a potential energy barrier between cementite and austenite solution. Another possibility is that the excess sulphur is situated in the cementite, thus affecting its decomposition.

Pouring temperature and section size markedly influence the rate of solution. A thin section cast at high temperature has a structure of closely interwoven cementite and pearlite. Such irons anneal very rapidly, almost without regard to compositional variations. The centre of heavy sections, however, with coarse, massive cementite particles is a very different proposition.

Assume, now, that by routine testing and experience, there has been achieved a sufficient reduction of carbon content—how important is the rate of cooling, particularly in relation to cooling through the critical range. It should be remembered that the castings are at 1,000 deg. C., and it is obvious that the rate of cooling will depend entirely on the residual carbon content and average section. Thin sections in which the carbon has almost been completely eliminated do not need slow cooling, but if there are sections still containing over 0.9 per cent. carbon, certain precautions become necessary. At about 720 deg. C. austenite can only retain about 0.6 per cent. carbon in solution unless drastically cooled, and it is not easy in the iron sulphide irons to cause the excess to precipitate on to existing nodules. Unless cooling to the critical range is slow, therefore, the excess carbon is precipitated around the austenite grain boundaries as pro-eutectoid cementite. A structure of this type is very shock brittle. Cooling to just above the critical range should, therefore, wherever thick sections and combined carbon contents above 0.7 per cent. are concerned, be extremely slow.

REFERENCES

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9 H. A. Schwartz—"Relations of Carbon Nodule Size and Tensile Properties"—Translation, A.S.T.M., 1939.

10 A. Sauveur—"The Metallography and Heat-treatment of Iron and Steel."

11 J. E. Rehder—"Pearlitic Rims in Malleable Iron," "Formation Due to Oxidation of Silicon, Increasing Stability of Cementite"—Canadian Metals & Metallurgical Industries, vol.8, August, 1945.

12 Surface Combustion, Limited, U.S.A. British Furnaces, Limited, Chesterfield, Engand.

13 W. Baukloh, F. Schulte and H. Friedericks—"A Study of the Processes Involved in the Malleabilising of Unalloyed and Alloyed Cast Iron in CO/CO_2 Mixtures"—Iron and Steel Institute Translation No. 158, December, 1943.

(*To be continued.*)

BOOK REVIEWS

Controlled Atmospheres for the Heat-treatment of Metals, by Ivor Jenkins, M.Sc. Published by Chapman & Hall, Limited, 37, Essex Street, Strand, London, W.C.2. Price 50s. net.

The metallurgical student is introduced to gas and metal reactions at his first lecture, probably in connection with the reduction of iron in the blast furnace. It is, however, much later before he delves into the subject of heat-treatment. The reviewer's first practical approach to the subject matter of this book was during an investigation into an atmospheric pollution problem. The furnaceman whose job it was to reheat steel for forging rightly insisted that he must use a smoky atmosphere, otherwise he would burn his work, but the civic authorities were equally insistent that he must not create a public nuisance. Every week, the process metallurgist is thinking around some phase of this absorbing subject, and a text book specially devoted to it is obviously most welcome. By dividing the book into three sections a logical approach has been made. First there is the generation of controlled atmospheres; then their purification and analysis, and finally their industrial application. Obviously it is this last section which will carry the major appeal to the metallurgist. In six chapters, the author covers low- and high-carbon steels, alloy steels, carburising, nitriding and non-ferrous metals. Rather surprising is the complete absence of any reference to malleablising; especially is this so since the author is well versed in this new and fascinating development. This lapse should certainly be corrected in the next edition. Despite this, the metallurgist now struggling with the perfection of gas annealing of malleable should carefully study sections I and II as a knowledge of what are probably unfamiliar materials to him, will avoid later trouble.

The book is unique, logically set out, well written, and adequately illustrated and indexed; it can be unreservedly recommended to those whose work lies in this field.

V. C. F.

Characteristic Data on the Mixture of Air and Water Vapour for Atmospheric Conditions, by J. R. Finniecome. Published by Emmott & Company, Limited, 31, King Street West, Manchester, 3. Price 2s. 6d. net.

This book gives a mathematical treatment of problems relating to the cooling and heating of mixtures of air and water vapour, and presents data which are not easily procurable in handy form. It should be of major interest to engineers engaged on cooling towers and similar work.

The Calculation of Heat Losses from Steam Pipes, by H. Buckley. Published by Emmott & Company, Limited, 31, King Street West, Manchester, 3. Price 2s. 6d.

This book is of special importance at the moment in view of the fuel economy drive. There is obviously an optimum economic thickness of insulation for any specific duty, and this book outlines the necessary calculations. In addition, useful graphs and tables are included to clarify and simplify the subject.

ADJUSTABLE PATTERNS

By "CHIP"

Many foundries still handle considerable amounts of general engineering castings of a jobbing nature and for such must keep pattern-making costs to a minimum. A particular line of castings in which adjustable patterns can be used is certain types of medium size of cylinder in which the bore remains constant, but the stroke varies for different orders.

Several means can be adopted to accomplish this end and all have their particular merits. Mounting the various parts forming the body upon a triangular or trough-shaped bar, however, has a decided advantage over that of a square form, or a telescoping arrangement as sometimes used, as all danger of tightness due to swelling has been minimised.

Making a full-size layout of the work in hand is a feature of pattern-making that, while often overdone, cannot always be dispensed with; but when objects are symmetrical about their centre lines, as the cylinder in question, a half or even a quarter layout will answer the purpose.

In making an adjustable pattern for such a casting, the initial step is the building up and turning of the barrel portion. If it is intended to make provision at the start for all the various lengths of cylinders required, it is easiest to prepare the various sections which form the pattern and make the largest first. The bar is first prepared of sufficient length to accommodate all the pattern work, including coreprints, for the largest cylinder. Over this bar fit the various portions forming the pattern, the lengths, these being such as to facilitate the making-up of the desired length of any particular cylinder by the removal of one or more of these intermediate sections and sliding the portion forming the flange and core-seat up to the body. In the case of the shortest pattern of the range the triangular bar would protrude beyond the limits of the core-seats.

The mounting bar should be strongly made and well braced, as this is what may be termed the backbone of the job, as it supports and keeps the various sections in line. The different pieces made to facilitate the building of a longer pattern should be made interchangeable, as they will be required to be used in a variety of combinations. For this reason exceptional care should be exercised in their construction and a template used in boring all dowel pins, bolt and screw holes. Whilst the triangular bar locates the various pieces of the pattern they are kept together by means of both, as this is a far better means of facilitating rapid change-over than the use of screws.

SOME THOUGHTS ON FOUNDRY MANAGEMENT

At a meeting of the Lancashire branch of the Institute of British Foundrymen, held recently, Mr. J. Roxburgh presented a Paper entitled "Some Thoughts on Foundry Management." This Paper was originally published in the FOUNDRY TRADE JOURNAL for January 24, 1946.

Vote of Thanks

MR. C. VAN DER BEN, in proposing a vote of thanks, said the training of apprentices with a view to their filling executive positions was very fascinating, although it did not appear to be quite definite what would be the correct approach to such a desirable end. The personality of the individual would certainly be a considerable factor in the ultimate selection.

MR. W. N. COOK, seconding the motion, said that he considered the Paper to be more in the nature of a treatise than of a lecture. In the Manchester area at the present time a committee was sitting to consider the training of apprentices, and very soon a report upon the subject would be submitted to the branch. After the vote had been carried, MR. ROXBURGH admitted that no one man could be expected to acquire a knowledge of foundry management which could be credited as being encyclopædic, but at the same time as much general knowledge as possible should be acquired in addition to specialising. As a foundry undertaking grew, so its manager must surround himself with specialists to deal with various aspects of the work undertaken. At the same time he must be able to organise the whole of the business and direct the thoughts and labours of such specialists. The art of management was to have good men serving an undertaking, and he had been interested in Mr. Van der Ben's remarks in that connection.

A controversial point introduced was apprentice training. Some people believed that it would pay to have a foundry specially created for the purpose. Thus, an apprentice would not be trained at any particular company's foundry, but he would choose, subsequently, where he was going to work. Personally, he had had some experience in tackling the subject of the training of potential executive members of staffs. His view was that in the case of a lad showing promise, it was best to put him in the laboratory first, where he would learn something of a scientific approach to his work. At the moment he had two such lads who had been in the laboratory for a period of five or six months. They were now in the core shop and pattern shop acquiring necessary practical knowledge, and it might be the case that they would develop into metallurgists, foundry foremen or managers; only time and opportunity could decide that.

DISCUSSION

MR. C. VAN DER BEN queried Mr. Roxburgh's last statement, as he could not quite understand how that could be brought about. To what extent would six months' service in the laboratory constitute an introduction to metallurgy, and how would it be possible to follow it up? This would seem to be the crux of the whole position; how long could be devoted to one side or branch of foundry work, and what was the necessary period of time to determine the aptitude of the individual in some particular direction? It was the old question, of course, of a little knowledge being a dangerous thing.

MR. ROXBURGH said that the two young people referred to had started on the particular course with the definite idea of staying in the foundry, but, in his opinion, if they did not show aptitude in that connection they would be returned to the laboratory. The point he wished to make was that he had selected those two particular youths in order to train them for the foundry and become executive members of the staff in some particular instance. Should they not make the grade, they would have to concentrate upon some one aspect of foundry work.

MR. A. SUTCLIFFE asked if Mr. Roxburgh would consider a man who had been in a foundry for 10 years to be a qualified man.

MR. ROXBURGH agreed that there was always something fresh to learn in a foundry, even up to the age of retirement from active service.

MR. SUTCLIFFE said that competition, castings, and salesmanship played a very important part in the conduct of a foundry.

MR. ROXBURGH admitted it was a controversial question. He appreciated the point with regard to the cutting of prices, say, in times of depression. Such cutting was foolish, and usually occurred because firms had no adequate costing systems. If costs were known accurately, then a reasonable price could be quoted under healthy conditions of competition.

Specialist Training

MR. FELLOWS said comment had been made concerning a method of training foundry apprentices in a detached special foundry. Seeing that some foundry workers were engaged in shipbuilding castings, others in general engineering, others in railway equipment, and so forth, would it not be a better idea to enrol apprentices in all such branches and train them as specialists?

In actual practice this was anything but the rule. A man would be trained in one part of the country, and would then move, for instance, 100 miles away to a totally different line, and, of course, each individual industry had its own problems to solve. There arose the question as to what type of man should hold executive jobs. Personally, he considered that if a man was a specialist in any branch of the trade, his next qualification befitting him to become an executive would be his natural ability for promoting organisation.

MR. ROXBURGH replied that what he really had in mind was that throughout the various districts of the country it might be possible to have a foundry where an apprentice could be trained over a certain number of years. It might be the case that in the Midlands he would receive his training in the motor industry, while in another district it would be more or less in shipbuilding. Industries arose in various parts of the country according to the engineering requirements of

Thoughts on Foundry Management

the particular district. On the other hand, the more variety a youth could have in his method of training the better a craftsman he would become.

There were instances of pattern-makers, moulders, or metallurgists having become foundry managers. Provided that a man had a flair for organisation and scientific control, there was no reason why he should not become a foundry manager. It would then be incumbent upon him to employ the necessary specialists to deal with problems concerning which he had insufficient knowledge to enable him to cope with them.

He had mentioned in the Paper that individuals had become foundry managers without having qualified as practical workers in the foundry. Though this, to some extent, was regrettable, yet it must be realised that people who were instinctively good administrators could make progress in a job they undertook because they had studied the art of business scientifically and were able to apply scientific principles to a job.

Practical Experience an Essential

MR. D. FLEMING thought that there was a certain amount of confusion involved in the consideration of the training of apprentices and the training of young people for administrative positions. Practical experience in the operations of the foundry was essential. He could visualise a foundry where the manager did not know the first thing about making castings himself, but dealt with executives who were specialists in their own particular line and controlled each section of the undertaking. The final direction might be controlled by someone who had never even seen a casting and had perhaps never been in a foundry, but who understood what was required of a casting. As soon as one tried to lay out a picture of uniformity they would be led into a trap. Youths had to be taught some small section of the work if they were to become practical men. If they were going to be administrators, then teach them to be such.

MR. ROXBURGH, having been in charge of foundries for more than 20 years, would not like to occupy such a position without having been a practical worker. His point in stating that all potential executives should have practical experience was in order to safeguard the man who eventually came to the top. The utmost importance must be placed upon the practical side.

MR. FLEMING thought his point had been misunderstood. He was taking a very wide outlook where the man at the top was not necessarily a practical man. The confusion of thought would seem to arise because everybody tended to think of a foundry as laid out normally.

MR. W. N. COOK said he did not think Mr. Roxburgh necessarily indicated a man who had served seven years' apprenticeship as a practical foundrymen. A man should have a reasonable degree of education which, after all, was not necessarily training him to be a specialist, but to think and notice and understand what went on in the foundry. If, in addition, a man had had a scientific education it would be of material assistance to him whether he was engaged in a foundry or in any other job. Such a man could use his brains and thereby attain practical experience. Was that what Mr. Roxburgh meant?

MR. ROXBURGH said that that was what he did mean to a great extent.

Falkirk Training Scheme

MR. HAMSON said a foundry was now coming into existence in the Falkirk area which was well adapted for the training of apprentices. It had been organised by the light castings makers, and a number of foundry undertakings had co-operated in the idea, and had enlisted the assistance of the local educational authorities. Much money had been expended, and good technicians had been engaged to teach the local youths how to make light castings. It was believed that the craft could enrol youths into the foundry better than the school appeal. The average youth who had left the school did not want to go back again, but would go into the foundry to learn the craft though he might return to the school later on in life. It was to be hoped that similar foundries of another type would be opening up in the future.

He disagreed with Mr. Roxburgh's argument with respect to costs. Obviously, estimates of costs were essential. Surely if the costing system served as a check upon estimates, then a costing system would be better than one which would probably create a lot of worry. The asinine pricing of so much per cwt. was merely an excuse to avoid proper costing and estimating. He endorsed Mr. Roxburgh's remark about lads coming to the foundry *via* the laboratory. Personally, he had two lads who were doing so, and they were making good progress.

MR. ROXBURGH said in large undertakings a planning engineer was appointed who was able to lay out a job, and who maintained a liaison between the pattern shop and the foundry, while any layout must be approved by the foundry manager. That was an ideal method of procedure. Although he gave every credit to the pattern shop, it was far better if the efforts of it were directed in the first place by the foundry manager.

Check Upon Estimates

Mr. Hamson's point was that costs were a check upon estimates. To a great extent he agreed. As an example, if there was a running line, and he had had jobs running in the foundry for five years, when the estimate was prepared, a percentage was placed on scrap for the job. This was merely an illustration, but it was a standard to which they worked. Over certain regular periods a check was made of that standard in order to ascertain how the job was going. If they quoted 10 per cent. scrap and it came out at 12½ per cent. over a period, they wanted to know the reason why, because it affected the profit. On the other hand, if the scrap came out at 8 per cent. they knew they were doing well. Very detailed costs were obtained which were submitted monthly to everyone concerned, and an investigation took place upon all points of

(*Continued on page* 84, *column* 2.)

BIRMINGHAM FOUNDRYMEN'S ANNUAL DINNER

SIR PETER BENNETT REVIEWS FOUNDRY ENTERPRISES

Mr. D. H. Wood (President), Mr. T. Makemson, M.B.E. (Secretary) of the Institute of British Foundrymen, and Sir Peter Bennett, M.P. for the Edgbaston division of Birmingham, and chairman of Joseph Lucas, Limited, Birmingham, were the principal guests attending the annual dinner and dance of the Birmingham, Coventry and West Midlands branch of the I.B.F., held at the Botanical Gardens, Edgbaston, Birmingham, on January 11. The chair was occupied by Mr. E. C. Dickinson (branch president), and the company of members and their ladies numbered approximately 250.

In submitting the toast of "The Institute and the Birmingham Branch," SIR PETER BENNETT paid tribute to the work the Institute was doing for the industry, and also what the foundry industry was doing for the industry of the country as a whole. Industrialists realised how important foundrymen were. Recalling how Birmingham became the centre of the metal industries, Sir Peter contended that it was because it was one of the free places in the country and manufacturers were allowed to come and develop their trades without let or hindrance. In the past they had largely been based on iron, and to-day the foundry industry was as important as ever it was, being the basis of engineering. Some of the basic industries of the country caused the most trouble in the House of Commons because they had neglected their opportunities, and investors had taken all the profits out of them, and left them to be reorganised by those left behind. The foundry industry, however, had its scientists and research organisations, and had realised, as all outside it did, the value of co-operation. Co-operation was the only way to get more out of a pint pot than was put into it. Therefore, he was a great believer in technical institutes and research associations. He appealed to firms to invite other foundry owners to inspect their works. If the visitor copied them they need not worry as they would have better methods to-morrow. It was only by such means that this country could hold its own to-day.

The Recruiting Campaign

The foundry industry, like other industries, had its troubles, but it was not sitting down to them. They were keeping the industry up to the mark by tackling mechanisation, but they were not waiting for it. He was delighted to hear of the efforts being made to overcome the great problem of the labour shortage. Most industries were faced with the same problem because young men were picking the nice and easy trades and leaving the hard and dirty ones behind. By tackling the problem of endeavouring to make the young men understand there was a good future before them in the industry they were doing a good job of work. What was needed to-day was for all to take a balanced view of things. We all had our troubles, and we should have more, but the times were unique because we had always gone through some ghastly periods after all wars. We were not the only people worrying about coal, and on the Continent and in other countries the position was worse. We must be prepared for the coal industry experiencing an awkward time, and it would be a long time before it recovered. Unless all worked to economise during the summer we should have a worse winter than the present one.

Need for Initiative

Our great need to-day was to recover the spirit of initiative which had made the nation what it was. We had developed a false doctrine: too much was heard of security first and easy money. Fear of security and of unemployment was not the gospel to preach to the young people to-day. A certain amount of security was good, but a man did not do his best work when he felt absolutely safe. He did his best work when he felt something might go wrong, and we must give the young people a chance to show their ambition. He believed that the British people were resilient and would think and work as hard as they had done in the past. There was still plenty of scope for the spirit of adventure, and our hope lay in the young people. Let the older men look round, train the young people and get them going. The foundry industry was still vigorous, and by adopting that policy it was working on the right lines.

Iron and Steel Questionnaire

Replying, MR. D. H. WOOD said he would like to take the opportunity of thanking the branch for the admirable way in which the 1946 annual conference was organised; he also congratulated them upon the success which followed their efforts. It was a great honour to be President of the Institute, which now had a membership of over 4,000, and was doing a wonderful job of work. In no institute or association was there a greater feeling of fellowship than in the I.B.F. Sir Peter had referred to the fuel situation, and only that week he had heard of a foundry which was on the point of closing down for lack of fuel, but another member of the Institute promptly loaned 20 tons of coke. That was the spirit which dominated that Institute of which he felt proud. The art of founding was the most ancient of all crafts and always possessed some of the most highly skilled men in the world. It still had skilful craftsmen, but too few of them. In a reference to the shortage of castings, Mr. Wood said that what was needed to-day was someone who could tell them how to make castings without labour and fuel. Literally, in that industry they were living from hand to mouth, and very little reached the mouth. There had been a number of references in the Press recently to the Census of Production, and while he did not know how they were going to answer the questions, in the course of the next few days they would receive a questionnaire sent out by the Council of Ironfoundry Associations on behalf of the Iron and Steel Board. In the view of the C.F.A. it was in the best interests of the

Birmingham Annual Dinner

Institute that that questionnaire should be completed and returned to the Board at the earliest possible moment.

After thanking Sir Peter Bennett for his kind reference to the Institute, Mr. Wood briefly mentioned the work of the Birmingham branch, which was the second largest in the country. The success of that gathering was indicative of the alertness and keenness of its members, council, and office bearers, and the members were to be congratulated upon the progress realised. There might be criticism of the condition of some of the foundries, but on the other hand there were many foundries in which the conditions could be highly praised. Let them remember the benefits derived from the founders of the Institute and see that the good work they did was improved upon and handed on to their successors.

New Training Facilities

"The Guests and the Ladies" was proposed by MR. E. C. DICKINSON (branch president), who thanked Sir Peter Bennett for his fine speech and the kindly reference he made to the Birmingham branch. Sir Peter's firm was helping the automobile trade to get motor-cars back into the showrooms, and when that time arrived he thought all would be happy. They remembered Sir Peter for the splendid work he did during the war in connection with the Production Panels which helped them so much. All were sorry that Mr. R. J. Rogers, president of the Institute of Vitreous Enamellers, was unable to be with them, and all would wish him a speedy recovery from his illness. In his absence, Prof. Aitchison, who was recently appointed to the Chair of Industrial Metallurgy at the University of Birmingham, had agreed to reply to that toast. He also welcomed Mr. J. Wilson, the new principal of the Birmingham Central Technical College, who came to Birmingham from the Coventry Technical College where he rendered excellent service. They hoped that when those two new educational personalities were planning the future of their colleges they would bear the foundry industry in mind. As Sir Peter remarked, there was no doubt they wanted to get the young men into the industry, and to give them the idea that there was a future for them in the foundry. He hoped, therefore, that Prof. Aitchison and Mr. Wilson would give youth every encouragement to take up foundry work. He also extended a hearty welcome to Mr. Tom Makemson, Secretary of the Institute, and his able lieutenant, Mr. John Bolton.

Foundry Metallurgy

PROF. AITCHISON remarked that a good deal had been said about the Institute, and everyone had talked about iron, but he was glad the Institute took a more catholic view of metallurgy than that. He hoped the Institute would not regard metallurgy as a ferrous or non-ferrous subject, but that it would take in all branches of the science. The University of Birmingham in the newly established Industrial Metallurgical Department had created courses in which foundry metallurgy played a prominent part. Those courses were founded on the basis of covering three needs, men, machine, and management. In alloying scientific knowledge with production principles they were producing men who would not only have a scientific knowledge, a theoretical knowledge of metals, their habits, actions, and reactions, but would also be trained in the art of production so greatly needed to-day. Those courses were already in being. As an actual fact, 10 men were in the final of the undergraduate term, and 10 in the post-graduate term. Foundry metallurgy was one of the foremost sections of those courses.

HOUSE ORGAN

?—Published by Rubery Owen & Company, Limited, Darlaston, for the Owen organisation.

This being the first edition, this review does not yet possess a title. In fact, a prize is being offered to employees of any of the constituent companies for the accepted suggestion. Ours is ROTOG—Review of the Owen Group. This new bulletin is purely for the 16,000 odd employees of the firms comprising this group, and its success will depend on the co-operation accorded to the editors by an enthusiast in each of the 16 associated concerns. The first issue is quite good, but it will be the next two or three which will count.

SOME THOUGHTS ON FOUNDRY MANAGEMENT

(*Continued from page* 82.)

difference from a certain standard. This cost-proof acted as a kind of barometer for the works.

MR. R. S. YEOMANS thought that at the present time a successful executive member of the staff was someone who was running a business successfully.

MR. ROXBURGH said there was a good deal of talk taking place at the present time about the lower productivity of workmen in general. He did not subscribe to that point of view, because he was employing 20 per cent. less men than he did pre-war and was turning out the same output. Therefore, he contended that he was getting 20 per cent. greater output. A friend in Scotland informed him that his greater output was now 10 per cent. Whether this was a test of good management or otherwise, he would leave the members of the branch to judge.

GERMAN TECHNICAL REPORTS

Among the latest reports on German industry issued by the British Intelligence Objectives Sub-Committee are two of interest to the foundry industry. They are:—

B.I.O.S. 700—The German centrifugal castings industry. With special reference to the production of cast-iron pipe, cylinder liners and piston rings (price 8s. 3d., post free); and B.I.O.S. 788—The German vitreous enamel industry (5s. 2d.).

SYNTHETIC RESIN CORE BINDERS*

By H. L. GEBHARDT

Foundries are continually being called upon to produce castings of more intricate design, with metal thickness, dimensional tolerance and surface texture being required to meet even more exacting standards. In this race for better castings the core-maker is often called on to set the pace. Improved castings usually call for new techniques in the core room. This search for new and better techniques has led to the use of a new bonding agent for core sand—synthetic resins. These newer core binders were needed to give faster baking and to provide faster collapse of a core on pouring. Thin-walled castings needed extra protection against hot cracks and a smoother metal surface next to the core was also in constant demand.

Synthetic resin core binders are the newest type of bonding agents to be adapted to foundry use. They are completely distinct from drying oils in their behaviour and derive their value for core work through reactions new in foundry practice. These synthetic resins are cured with oven heat, and oxygen is not needed to set the bond. Baking temperatures average 50 deg. C lower than that required by drying oils, and baking time averages a quarter to a half faster. These new binders are water soluble and hard-surfaced cores result from migration. In a cured state these bonds are moisture resistant, and once formed, the bond is tough and hard but burns out fast in contact with molten metal.

Synthetic resin core binders can be baked to a cured condition in ovens that range from 120 to 175 deg. C., and the baking cycle will be complete as soon as the core has been dried of moisture. Also, being water soluble, the binder tends to migrate toward the surface of the core as moisture is being driven out with oven heat. Finished cores can be processed in this way to a hard, dense surface and a softer centre, conditions favouring a fast collapse on pouring. These low baking temperatures and the time saved in baking, through not having to oxidise the bonds, were responsible for the earliest foundry tests.

Nature of Resins

The essential difference between natural and synthetic resins lies in the fact that natural resins are thermoplastic and synthetic resins are thermosetting. Natural resins as a group include gum rosin and wood rosin and exist in nature as the resinous portions of certain pine trees. These natural thermoplastic resins can be melted repeatedly with heating to a liquid condition and, on cooling, will revert to a natural solid and brittle state. Nature does not produce thermosetting resins; such resins are strictly artificial. Once the finished bond is formed, it cannot be remelted, but it can be destroyed with heat. Synthetic resins and the plastics industry are so closely associated that it is difficult to discuss one and not mention the other. Of the various types of plastics now being made, the urea-formaldehyde resins have proved to be most suitable for foundry service.

Synthetic resins are produced in a resin reaction kettle so designed as to provide controlled heat, agitation, and a condensing medium. The cooking operation can be carried on at atmosphere, under pressure, or in vacuum, as the need requires. An important part of the reaction involves careful control of the acid or alkaline condition of the mix and expert timing. When the process is complete, the resin in liquid form is drawn off. It will contain varying amounts of water but is a finished product for a variety of applications. Certain other applications require its use in dry or powdered form, particularly as moulding compounds for the plastics industry. This change can be accomplished by spray drying the liquid resin. Both liquid and powdered resins are being used as bonding agents for cores—the liquids to emphasise migration and the powders to favour cross-sectional strength.

Developments of Application Techniques

Any product is a suspect until the foundry has been sold on its performance. This was particularly true in the case of synthetic resin binders. The sand treated with these binders had a different feel, lacking lubrication that core oil afforded. At the mixer the smell was different, core boxes required cleaning in a slightly different manner, cores baked without changing colour and a hot oven burned the binder. But application techniques developed rapidly, and synthetic resin core binders now have come to be depended upon where a fast bake and a fast collapsing core is important. Any attempt to appraise the value of these new binders for the core room would deal largely with a study of what happens at each step in the process of core-making.

There are no types of core sand which must be avoided. Sands which respond well with oils will show equally good performance with synthetics. If there is any difference, it lies in the fact that finer sands can be used with synthetics, ranging down to types which are classed as float sands. Reclaimed sand also has been bonded with these resins and used again in the core room.

When cereal binders are added to the sand mix, it is often good practice to choose them for water soluble traits. Certain Dextrins, rated by the manufacturer as 95 per cent. water soluble, will aid shell hardness by a tendency to migrate with the resin toward the core surface; other cereal binders, which class as heavy yellow flours and which are rated 9 to 11 per cent. water soluble, will definitely build up centre strength. Either type can be used safely with cores which must be stored, for it is characteristic of synthetic resin core binders to cover the cereals and naturally afford moisture-proofing to the same extent obtainable in a straight core oil. Cereal binders which naturally show good dry or baked strength are often used as extenders for synthetics since less binder will be required in the sand mix to obtain standard strength.

Core sand to which only synthetic binders and tempering water have been added will show about the same green strength as the same sand and oil, although

*Extracted from the "Iron Age," by courtesy of the editor of our contemporary.

Synthetic Resin Core Binders

some foundries find higher green strength in the use of synthetic resins. When cereals are added to stiffen the sand mix, heavy yellow flours have been preferred, and green compression values up to 2½ lb. per sq. in. are regularly developed. Bentonite in extremely small amounts has been used. A distinctive difference in green compression was noticed by one foundry when synthetics were substituted for oil in a processed sand mix used for magnesium. This was a mix to which sulphur, boric acid and cereals had been added in regular proportions. With 1 per cent. of cereal binder in this particular mix, cores showed a green compression strength of 1 lb. per sq. in. If synthetic binders were used to replace the oil, it was observed that green compression strength showed a drop to 0.8 lb. per sq. in. But when synthetic binders were increased to develop high tensile strength in the cores (in the 200-lb. class) then the mix with synthetics will develop double the green compression as compared to an oil bonded mix built up to the same tensile strength.

While core sand which has been mixed with synthetic resin core binders will not cure on standing without having heat applied, it will air dry and tend to crust over at the top as moisture is drawn out into the air. While this action accelerates at higher temperatures, foundries regularly using synthetics find that the prepared sand keeps in good working order for 12 hrs. at an average room temperature of 80 deg. F. Crusted top sand can be pushed back into the heap and worked. Or, when sand is required to stand for any length of time, as in hoppers, it can be covered with wet bags.

Reduced Baking Time

Baking time for synthetic resin core binders will depend on the size of the cores and the amount of water used in the mix. The core will be baked a few minutes after it has been dried of moisture with oven heat. White sand will not change colour except as it indicates an overbaked condition of the core. The fact that synthetic resin binders do not require a time cycle for oxidation has speeded baking to the point where it is being done one quarter to one half faster. Cores can be baked successfully at temperatures ranging from 120 to 205 deg. C., with a range of 162 to 185 deg. C. generally favoured. At temperatures close to 176 deg. C. cores can overstay the natural baking periods and not be damaged with oven heat. At higher temperatures they will have to be removed from the oven as soon as the binder sets or cures. Temperatures above 200 deg. C. can be extremely critical when urea-formaldehyde resins are used and overtime in a 260 deg. C. oven will actually burn out the bonding resin and cause the core to collapse with oven heat. Phenol-formaldehyde resins show better heat-resisting qualities, but do not collapse as freely in contact with hot metal and for that reason have not come into such general use as the urea-formaldehyde types.

The one distinguishing trait which forced synthetics to the front was its rapid response to heat in baking. This unique behaviour suggested, first, the use of infra-red rays as a heating medium, and cores of various sizes were baked under infra-red lamps with very fast timing. Strainer cores can be brought to a cured condition in 15 mins.; tensile strength cores 1 in. thick are baked in 30 mins.; chunk type cores 7 in. high and weighing 13 lb. will bake with a 75-min. exposure in a light tunnel when four rows of lamps are used.

The Newer Drying Methods

Infra-red lamps have been used in the foundry as a medium for drying moulds for a number of years. Now the same method of applying heat has been found adaptable to baking cores made with synthetic resin binders and a new avenue of relief afforded to core rooms whose oven capacity is desperately overcrowded.

The second urge to try synthetics for a really fast bake came with newer applications of dielectric or radio frequency heat. This type of heat, as distinct from heat transferred from an outside source, is generated in the object treated, permitting a core, for example, to develop the same temperature at the centre as at the surface. This method of generating heat in materials which are normally non-conductors of electric current, as well as poor conductors of heat itself, will cure synthetic resin core binders at speeds new to the founding industry. Cores are simply placed between the electrodes of a high frequency field and in a matter of seconds the job is done. One of the earliest applications of dielectric heat was in 1943 to cure synthetic resins used as the bonding agent for core sand. A core 6 in. square at the base and 1½ in. high was heated between two electrodes and brought to a baked or cured condition in less than 100 secs. More recently a disc-shaped core of 3¾ in. dia. by 1¼ in. high and weighing 14½ oz. was completely dried of its moisture content and the resin binder cured in 60 secs.

While cores which are flat top and bottom will bake out with the greatest economy of electrical energy when the top electrode is almost in contact with the core, it has been found more practical with irregularly shaped cores to space the top electrode a short distance above the highest points. This method will dissipate some of the current but will prevent overbaking the high spots and leaving the lower sections underdone.

The cost of a transformer or generator for radio-frequency heat may appear high for the foundry budget, but the answer as to whether it will pay out depends on the value which can be assigned to a quick bake and a fast throughput.

NEW CATALOGUE

Non-ferrous Castings. A rather bad "bloomer" has been made in one of the two catalogues just issued by Charles Carr, Limited, Grove Lane, Smethwick, Staffs. Both in text and caption reference is made to "Colonial," whereas it is obvious and important that the word "Dominion" should have been included. This spoils what is otherwise a splendid example of modern publicity. The second catalogue covers chill-cast bronze rods and tubes. It lists in six pages the sizes and weights in lb. per foot, of both solid and cored sticks, which indicates the extensive range required by industry.

INSTITUTE OF VITREOUS ENAMELLERS

QUARTERLY MEETING IN LONDON

The quarterly meeting of the Institute of Vitreous Enamellers is to be held in London on January 30. Details of the programme are given below.

In the morning, a Paper by Mr. Cameron, of Coldair, Limited, Wembley, Middlesex, will be given. This will be followed by luncheon at the Café Royal. In the afternoon, a visit to the G.E.C. research laboratories and the Osram G.E.C. glassworks, has been arranged.

After tea, a technical session will be held in the library of the laboratories, when Dr. Partridge will deal in more detail with the points raised in his Paper on "Glass to Metal Joints," given at the annual conference. It is intended that the visit may indicate similar and different procedures in the glass and vitreous enamelling industries. Members will see the melting of glass on a large scale at the Osram G.E.C. glassworks, and its manufacture into bulbs and tubing by machines. The measurement of physical properties of glass and of stress in glass to metal seals will be demonstrated in research laboratories. Members will also have an opportunity of seeing the X-ray and electron microscope equipment in addition to some phases of metallurgical research.

AN AMERICAN ALUMINIUM HOUSE

The American magazine "Modern Metals" reports that the "Everwear" prefabricated house, made by the Southern States Company, can be erected by two men. The manufacturers state that the basic objective in designing the new all-aluminium home was to get into quick production a truly low-cost home for ex-Servicemen and others who could not afford a conventional type of building at to-day's inflated prices. . . . and the desire was to produce a definitely permanent structure which would not be subject to early deterioration and consequent loss of equity value to the purchaser. The Southern States all-aluminium unit sells for only $899.75 f.o.b. Birmingham, Alabama. This unit consists of complete frame, clapboard-style exterior wall cover sheets, interlocking roof cover sheets, interior partition framing, exterior flashing and trim, plus necessary bolts and screws ready for immediate assembly. To this the purchaser must add foundation and flooring, windows and doors, interior wall finish and trim, plus desired wiring and plumbing. It is estimated that it can be completed by the purchaser for occupancy at a cost of from $2,500 to $3,000 (say, £625 to £750), depending upon the quality and extent of interior finish and fixtures.

THE NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, Glasgow, has received an order for 20 locomotives for the Argentine Railways, and for six locomotives for the Sao Paulo Railway, Brazil. The company also has orders on hand for 150 locomotives for the L.N.E. Railway Company, and 150 for the South African Railways.

INDUSTRIAL ATMOSPHERE POLLUTION

LECTURE TO ROYAL INSTITUTE OF CHEMISTRY

In a lecture which Dr. A. C. Monkhouse, deputy director of Fuel Research, gave to the Royal Institute of Chemistry last week, he estimated the total smoke produced per annum in Great Britain was 2.3 million tons, of which approximately one-half was from domestic grates. The total pollution by oxides of sulphur was about 5 million tons per annum, of which one-fifth was from domestic appliances burning raw coal. During the years 1937-39 systematic observations were made of atmospheric pollution at Leicester in order to obtain information on the distribution of pollution in a city and its environs. The smokiest district in Leicester was found to be the centre, and the maximum effect of wind was to move the point of maximum smoke concentration ½ mile down wind. Three-quarters of the smoke emitted in winter in central Leicester was from domestic chimneys. In spite of Leicester being isolated from other industrial towns it was found that 10 to 40 per cent. of the pollution in central Leicester, according to wind direction and the time of year, was derived from outside areas. The mean smoke concentration at the centre of Leicester was 0.17 milligrams per cub. metre in summer and 0.41 in winter. The highest concentration observed was about six times the mean value.

Sulphur dioxide is removed from the air by natural causes more rapidly than smoke. The smoke-sulphur ratio is a useful aid for observing variations in pollution. The least smoke per ton of coal burnt in Leicester was produced at the centre, and the highest in the inner suburbs.

Smokeless Zones

Smokeless zones are in effect zones not producing smoke. Tests taken in Hyde Park and Kensington Gardens show the smoke reduction at the centre of a square mile free from smoke emission to be 25 to 30 per cent. on the average, but may only be 15 per cent. on days with no air turbulence, and as high as 75 per cent. on days of high turbulence.

Smoke is due to imperfect combustion, particularly of tarry vapours. In a hand-fired boiler the evolution of combustible matter is not constant, a maximum is reached soon after firing. Smoke eliminators have been designed at the Fuel Research Station for forced- and natural-draught marine boilers, and for Lancashire boilers, which introduce by simple means sufficient secondary air at these periods of increased evolution of combustible matter. Tests made show that when heavy smoke is made, about 2 per cent. of the heat may be wasted as visible smoke, and an additional 6 per cent. wasted as combustible gases, such as carbon monoxide, hydrogen and methane.

Grit or fly-ash from boilers can be removed by standard apparatus such as cyclones, electrical precipitators, and water washers. The type of fly-ash is influenced by the system of combustion, dependent on whether the ash spheres are formed from ash particles lifted from the fuel bed, or from the combustion of fine coal suspended in air or flue gas.

PERSONAL

MR. S. H. BURCH has been appointed chairman and MR. H. S. LAMBURD managing director of Asea Electric-Limited.

MR. STANLEY PRESCOTT, M.P., has been elected to the board of General Cable Manufacturing Company, Limited.

SIR NIGEL L. CAMPBELL and CAPT. N. MARTIN have resigned from the board of Baldwins (Holdings), Limited.

MR. O. INMAN, chief engineer of Samuel Fox & Company, Limited, has been appointed a director of the company.

MR. K. C. LEE and MR. P. A. LEE have been appointed directors of Arthur Lee & Sons, Limited, steelmakers, of Sheffield.

MR. E. C. MASON, who has been with Cowlishaw, Walker & Company, Limited, for over 10 years, has been appointed chief draughtsman of the company.

MR. W. G. HENDRY and MR. W. H. MCFADZEAN, directors of British Insulated Callender's Cables, Limited, have left on a visit to the company's branches in India.

MR. J. E. EVANS, who was until recently hon. secretary of the Bristol Engineering Manufacturers' Association, has been presented with a cheque in recognition of his 11 years' service.

MR. ALBERT BUTLER, secretary of the Wolverhampton Metal Company, has retired. He joined the company as cashier 23 years ago, a post which he held until he became secretary three years ago.

MR. ALEX. L. LOUDEN, MR. HAROLD W. BOWES, and MR. JOHN F. CAMERON have been appointed additional directors of Pegler & Louden, Limited, brassfounders, etc., of Glasgow and Newcastle-upon-Tyne.

MR. F. W. OSBORN has been appointed Midland branch manager of the sales division of the British Aluminium Company, Limited, in place of MR. C. G. POUNTNEY, who has resigned from the staff of the company.

MAJOR-GEN. SIR JOHN N. KENNEDY and MR. P. B. TUCKER have been appointed directors of Cowans, Sheldon & Company, Limited, engineers, ironfounders, etc., of Carlisle, in place of MR. H. S. CARTMELL and MR. J. W. BRANSTON.

MR. J. S. WEIGHTMAN and MR. J. E. N. YATES, staff directors, have been appointed directors of Gaskell & Chambers, Limited, engineers, brassfounders, etc., of Birmingham. MR. M. R. CHAMBERS has been appointed secretary of the company.

MR. CLIFFORD HANSON has relinquished the position of publicity manager to Ernest Newell & Company, Limited, engineers and ironfounders, of Misterton, near Doncaster, having been appointed advertising agent to them and several other companies.

COL. SIR W. CHARLES WRIGHT having expressed a wish to retire from the chairmanship of Guest Keen Baldwins Iron & Steel Company, Limited, while remaining on the board, MR. JAMES HORNBY JOLLY, deputy-chairman, has been appointed chairman.

MR. JOHN MATHIESON has retired from service with the Consett Iron Company, Limited, at the age of 77. He joined the firm 55 years ago as private secretary to the general manager. He was afterwards sales manager and subsequently agent of the company.

MR. EDWARD THOMPSON, managing director of the John Thompson Engineering Company, Limited, of Wolverhampton, and associated companies, is leaving England shortly on a business trip to Australia *via* South Africa. He expects to be away about three months.

MR. E. T. JUDGE, chief engineer and a director of Dorman, Long & Company, Limited, who is responsible for the design and construction of the projected new steelworks and universal beam mill on the south bank of the Tees, has gone to the United States on business.

MR. STEPHEN L. FINCH has been appointed foundry manager of Catton & Company, Limited, Yorkshire Steel Foundry, Hunslet, Leeds. He was formerly connected with Leyland Motors, Limited, and more recently with K. & L. Steelfounders & Engineers, Limited, Letchworth.

MR. GORDON MCKAY CAMPBELL, who has retired from the board of the British Thomson-Houston Company, Limited, joined the company from the General Electric Company, U.S.A., in 1920. He directed the manufacturing operations of all B.T.-H. factories, introducing many beneficial changes in operational control.

MR. H. F. SMALLWOOD has been appointed chairman of W. H. Dorman & Company, Limited, engineers and ironfounders, of Stafford, in succession to the late Mr. S. M. Wilford. Mr. Smallwood joined the company in 1924 as its chief engineer, and was appointed a director in 1926. He became deputy chairman in March of last year.

MR. T. H. VARAH has been appointed resident technical representative of Edgar Allen & Company (South Africa), Limited. He joined the engineering department drawing office of Edgar Allen & Company, Limited, Sheffield, in 1923. In 1934 he took charge of the experimental and testing plant of that department. Mr. Varah visited Australia in 1939 and 1940 to supervise the erection and commissioning of a large rotary kiln installation. He later toured Australasia in an advisory capacity. In 1941 he returned to England as resident technical engineer in charge of successive war contracts for erecting and commissioning various plants, including equipment for the manufacture of calcium carbide, electrodes, etc. Mr. Varah visited the Middle East and Turkey in 1945 to negotiate contracts for cement-making and other machinery. On his return he worked on the estimating and tendering side of the engineering department.

Will

SAMPSON, F. E., chairman and managing director of H. Sampson & Sons, Limited, engineers and ironfounders, of Bristol £37,870

BRITISH INSTITUTE OF MANAGEMENT

COUNCIL MEMBERS APPOINTED

The following have agreed, at the request of the President of the Board of Trade, to serve on the first Council of the British Institute of Management under the chairmanship of Mr. C. G. Renold:—Mr. Robert Appleby, works manager, Ascot Gas Water Heaters, Limited; Sir Clive Baillieu, deputy chairman, Dunlop Rubber Company, Limited; Sir Charles Bartlett, managing director, Vauxhall Motors, Limited; Mr. W. B. D. Brown, managing director, Glacier Metal Company, Limited; Mr. G. Chelioti, director, General Electric Company, Limited; Mr. Roland Dunkerley, managing director, Vantona Textiles, Limited; Mr. B. R. Farr, general manager, Chivers & Sons, Limited; Mr. T. H. Gill, director, Co-operative Wholesale Society, Limited; Miss Caroline Haslett, director, Electrical Association for Women; Mr. A. M. Holbein, director and chief engineer, Demolition & Construction Company, Limited; Sir Archibald McKinstry, deputy chairman, Babcock & Wilcox, Limited; Dr. J. E. Myers, Principal, Municipal College of Technology, Manchester; Lord Piercy, chairman, Industrial & Commercial Finance Corporation, Limited; Mr. C. N. Potter, works manager, Ilfords, Limited; Mr. T. G. Rose, industrial consultant; Mr. O. W. Roskill, industrial consultant; Mr. H. C. Rutherford, director, Venesta, Limited; Mr. John Ryan, vice-chairman, Metal Box Company, Limited; Sir George Schuster, director, Commercial Union Assurance, Limited; Mr. J. W. Stephenson, director, British South American Airways Corporation, Limited; Sir Raymond Streat, chairman, Cotton Board; Mr. M. H. Taylor, managing director, Taylor, Taylor & Hobson, Limited; Lt.-Col. L. Urwick, chairman, Urwick, Orr & Partners, Limited; Mr. Harold Whitehead, deputy chairman, Jenson & Nicholson, Limited; Mr. R. E. Yeabsley, partner, Hill, Vellacott & Company.

The Federation of British Industries will be represented by Sir Norman Kipping, the Trades Union Congress by Lord Dukes, and the Civil Service by Mr. J. I. C. Crombie.

Sir Archibald McKinstry and Lt.-Col. L. Urwick have consented to act as vice-chairmen. With the exception of the three representative members, the members of the Council have been appointed in their personal capacities and not as representatives of any organisation. It is intended that this Council shall act until the preliminary work of setting up the Institute is complete and it is possible for the membership of the Institute to elect its own Council. Correspondence should be addressed to the Acting Secretary, Room 453, I.C. House, Millbank, London, S.W.1.

IN MEMORY OF the late Mr. J. T. Brockhouse, chairman and managing director of J. Brockhouse & Company, Limited, makers of springs and axles, etc., of West Bromwich, who died in April, 1944, a processional cross has been presented to Birmingham Cathedral by his son, Mr. John L. Brockhouse.

DECEMBER PIG-IRON AND STEEL PRODUCTION

The output of pig-iron in 1946 at 7,761,000 tons showed substantial advances compared with 7,107,000 tons in 1945 and 6,761,000 tons in 1938.

Production of steel last year was 12,693,000 tons, compared with 11,824,000 tons in 1945 and 10,398,000 tons in 1938. The 1946 figure represents the substantial achievement of the target output (12,750,000 tons) in spite of fuel and transport difficulties.

The table below shows that pig-iron production in December was maintained at the November rate. The output of steel, however, was affected by the normal incidence of the Christmas holidays.

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1946—1st quarter ..	145,000	7,566,000	242,600	12,617,000
2nd ,, ..	150,500	7,827,000	252,100	13,111,000
3rd ,, ..	146,600	7,622,000	229,900	11,953,000
4th ,, ..	154,400	8,029,000	251,700	13,088,000
November ..	153,900	8,002,000	263,800	13,715,000
December ..	153,200	7,966,000	236,300	12,289,000
Year	149,300	7,761,000	244,100	12,693,000
1945—1st quarter ..	134,500	6,993,000	233,200	12,126,000
2nd ,, ..	132,600	6,894,000	227,200	11,814,000
3rd ,, ..	132,600	6,893,000	211,300	10,988,000
4th ,, ..	147,100	7,650,000	237,900	12,369,000
November ..	150,000	7,801,000	247,500	12,870,000
December ..	145,500	7,563,000	221,500	11,519,000
Year ..	136,700	7,107,000	227,400	11,824,000

UNITED KINGDOM TIN POSITION

The Ministry of Supply has released the following figures showing the United Kingdom tin position for the month of November:—

		Ministry.	Consumers.
		Long tons.	Long tons.
TIN METAL:—			
Stocks at November 1		9,022	4,274
Arrivals		—	—
Production		1,897	—
		10,919	4,274
Deliveries:			
To U.K. consumers	2,217	—	2,217
For export	238	2,455	—
			6,491
Consumption		—	2,401
Stocks at November 30		8,464	4,090*
TIN ORE (Tin content):—			
Stocks in U.K. at November 1 ..		7,727	
Stocks in U.K. at November 30 ..		9,253	

* Calculated. Reported 3,603 tons.

THE BOARD OF TRADE are to take over the site of the foundry of Charles W. Taylor & Son, Limited, South Shields, for industrial development.

NEWS IN BRIEF

MACHINERY (BIRMINGHAM), LIMITED, is being wound up voluntarily. Mr. J. L. Smith, 115, Colmore Row, Birmingham, is the liquidator.

SIGMUND PUMPS (GREAT BRITAIN), LIMITED, is being wound up voluntarily. Mr. M. Sigmund, Team Valley, Gateshead, 11, is the liquidator.

THE BRITANNIC REFRACTORIES COMPANY, LIMITED, is being wound up voluntarily. Mr. W. A. Cutts, Genefax House, Sheffield, is the liquidator.

BARRONIA METALS, LIMITED, is being wound up voluntarily. Mr. A. W. S. Tabbernor, Kent House, Telegraph Street, London, E.C.2, is the liquidator.

AERO TOOLS & EQUIPMENT, LIMITED, is being wound up voluntarily. Mr. R. G. Bowen, 16 and 17, Theatre Royal Chambers, Birmingham, 2, is the liquidator.

THE GREEN ENGINE COMPANY (1930), LIMITED, is being wound up voluntarily. Mr. C. W. S. Temple, 5-6, Bucklersbury, London, E.C.4, is the liquidator.

RICHARDSONS WESTGARTH-BROWN BOVERI, LIMITED, is being wound up voluntarily. Mr. J. H. Tate, 13, Mosley Street, Newcastle-upon-Tyne, is the liquidator.

THE MARINE ENGINEERS' MUTUAL INSURANCE SOCIETY, LIMITED, is being wound up voluntarily. Mr. J. S. Thomson, 43, King Street, South Shields, is the liquidator.

THE SHAFTESBURY ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. F. W. Doleman, 24, Corridor Chambers, Market Place, Leicester, is the liquidator.

THE MILFORD ENGINEERING COMPANY (HUDDERSFIELD), LIMITED, is being wound up voluntarily. Mr. J. G. Turner, Station Street Buildings, Huddersfield, is the liquidator.

THE EPSOM ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. G. C. Jarvis, Ling House, 10-13, Dominion Street, South Place, London, E.C.2, is the liquidator.

THE AMERICAN IRON AND STEEL INSTITUTE reports that U.S. steel mills produced 66,364,000 tons of steel last year, compared with 79,702,000 tons in 1945, a reduction of 17 per cent.

THE WILLITON & DISTRICT FORGE COMPANY, LIMITED, is being wound up voluntarily. Mr. S. J. Hurley, of Risdon, Hosegood & Weston, solicitors, of Williton, Taunton, is the liquidator.

RICHARD CRITTALL & COMPANY, LIMITED, heating and ventilating engineers, etc., of Brentford, Middlesex, have formed an American subsidiary under the name of Richard Crittall Radiant Heating, Inc.

WE ARE RECEIVING by every post notices that firms are closing their premises for the receipt and delivery of goods on Saturday mornings. It thus behoves all concerns to ascertain from their suppliers and customers the existing situation.

THE EYRE SMELTING COMPANY, LIMITED, have sent us their 1947 calendar-chart, showing the sizes in which are produced the company's chill-cast phosphor-bronze and gunmetal rods. Readers who desire a copy should write to Tandem Works, Merton Abbey, London, S.W.19.

THE MINISTER OF LABOUR AND NATIONAL SERVICE has informed organisations representing employers and workers concerned that the limestone section of the quarrying industry will be withdrawn from the scope of the Essential Work Orders on or about March 31 next. The slag, igneous rock, sandstone and roofing slate sections of the industry have already been withdrawn from the scope of the Orders.

THOS. W. WARD, LIMITED, have purchased the whole of the share capital of Birchley Rolling Mills, Limited, Oldbury. The Birchley Company will continue to operate under the present name. Mr. H. W. Secker, chairman and managing director of Thos. W. Ward, Mr. C. L. Fry, Mr. W. W. Hickman, Mr. R. B. Trotman, Mr. S. J. Dyal, Mr. A. J. Wainford and Mr. P. T. Ward have been appointed directors of the Birchley Rolling Mills.

HARLAND & WOLFF, LIMITED, achieved their largest output in 1946 in any year since 1914. Last year 19 vessels, of 180,574 tons gross, were launched from the company's Belfast and Govan yards. The output of main propelling machinery from Belfast and Glasgow amounted to 310,190 i.h.p., a figure which constituted a record for the company. A large programme of reconditioning works was also carried out by the company during the year.

THOMAS SMITH & SONS (RODLEY), LIMITED, engineers and ironfounders, have produced an interesting sound film entitled "The Smith at Work," which demonstrates the full range of the company's products. Copies of the film, which has been produced in 16-mm. size, are available for exhibition to technical associations. The commentary to the film is by Mr. Frank Phillips, the B.B.C. announcer, while background music is supplied by the London Symphony Orchestra.

THE BRITISH ELECTRIC RESISTANCE COMPANY, LIMITED, state that they have concluded arrangements whereby a Government factory has been put at their disposal in Northern Ireland. In view of the heavy commitments in Northern Ireland, and because of present supply conditions, necessitating the holding of large stocks, resources are being conserved, at least until arrangements have been made for additional finance. Trading conditions are now showing an improvement, it is added.

IN A REVIEW of their activities during 1946, Yarrow & Company, Limited, Scotstoun, Glasgow, state that only one war vessel was completed and handed over during the year. Several merchant vessels for export abroad were also constructed. In addition to marine work the company have a considerable volume of land boiler work in hand for power stations and industrial establishments at home and abroad, including a recent order for South Africa to the value of over £1,000,000.

THE COMPANIES REGISTRATION OFFICE give notice that the names of the undermentioned companies have been struck off the register, and are thereby dissolved:—B.G. & H. Engineering Products, Limited; Foundry Industries, Limited; G.Y.M. Patent Screw Company, Limited; Lingfield Precision Engineering Company, Limited; Lyndmere Engineering Works, Limited; Stephensons (Presswork), Limited; Thorkildsen Rotary Valve Company, Limited.

CHILE'S INDUSTRIALISATION PLANS are reported to include the erection of steel and copper-fabricating plants and a large-scale electrification project. The steel plant, which is to be located at Concepcion, near the coal deposits, will have an annual capacity of 180,000 tons, producing light structural shapes, reinforcing steel, thin sheets and plates. It is claimed that steel can be produced in Chile at the same price, allowing 20 per cent. for dividends, as the average cost of imported steel at the port of entry.

SIR EDWARD APPLETON, in a speech prepared for presentation at a luncheon given by the Motor Industry Research Association, referring to the future, said we might, perhaps, later see motor-cars driven by jet engines, but those who had seen large stones picked up and hurled many yards by the exhaust from a jet engine would feel that it might be some time before they were suitable for use on public roads. In the case of atomic energy, the smallest atomic engine would at present weigh at least 10 tons, and, therefore, he did not expect to see them in the family car just yet.

THE PLANT OF THE Magnesium Metal Corporation, Limited, at Port Tennant, Swansea, established just prior to the war for the production of magnesium powder for war purposes, is being dismantled and sold. In addition to a very large quantity of general plant, the equipment includes some of the latest type of electric furnaces for the production of magnesium. Much of the plant is adaptable for other purposes, including six batch-distillation furnaces suitable for nitriding of steel. The whole of the plant and machinery is being offered for disposal by George Cohen, Sons & Company, Limited, Wood Lane, London, W.12.

MR. GREENWOOD'S FORECAST OF STEEL NATIONALISATION

"I think you can take it that by the time of the next General Election the iron and steel masters of Britain will have disappeared," said Mr. Arthur Greenwood, Lord Privy Seal, speaking at Wolverhampton recently. Some people thought that the Government were wilting because there was no mention of the industry in the Government's second-year programme, he said.

"Iron and steel are the basis of our industrial strength and we say that the iron and steel racket must cease. There is no way in which it will come to an end unless we take over its control. We appreciate the difficulties, but we do not regard them as insoluble," he added.

OBITUARY

MRS. MARION COATES HANSEN, principal of Hansen & Company, pig-iron and steel merchants, of Middlesbrough, died recently.

MR. ALFRED ERNEST HALL, who for many years carried on business as an iron and steel merchant at Wolverhampton, died recently.

MR. THOMAS NODEN WALDRON, who in 1919 founded the firm of T. N. Waldron, Limited, wire and press workers, of Stratford-on-Avon, has died at the age of 59.

MR. E. VAUGHAN JONES, who, during the first world war, was principal assistant shipbuilding manager to Cammell Laird & Company, Limited, Birkenhead, has died at the age of 80. He retired in 1923.

MR. JOSEPH BURN, who was in the service of the Patent Shaft & Axletree Company, Limited, of Wednesbury, Staffs, for 60 years, holding the position of confidential secretary to the managing director and several departmental chiefs, has died. He was 88 years of age.

SIR (COLLINGWOOD) GEORGE CLEMENTS HAMILTON, Bt., died recently, aged 69. A well-known electrical engineer, Sir George became the managing director in Manchester of Drake & Gorham, Limited, and chairman of the Expanded Metal Company, Limited. He was a member of Parliament for 24 years.

MR. NATHANIEL EDWARDS ROBSON, whose death occurred recently, was the sole surviving partner in the firm of Atkinson, Young & Robson, consulting marine engineers, of Newcastle-upon-Tyne. Mr. Robson, who was born in 1872, was with the North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne, for many years, leaving them as assistant manager in 1907, to become engine works manager of William Denny & Bros., Limited, Dumbarton. He was one of the founder members of the Society of Consulting Marine Engineers, and was a member of the Institution of Naval Architects and the North-East Coast Institution of Engineers and Shipbuilders.

GAUGE AND TOOL MAKERS' STUDENTS SCHEME

Negotiations are in progress between the Gauge and Tool Makers' Association and the Director of Zurich University, Zurich, Switzerland, for a regular interchange of engineering students.

Under the scheme, Swiss engineering students will come to England this year during their long vacation and obtain temporary employment in member-firms' workshops; and, where satisfactory arrangements can be made, will live during their stay in England with the families of works personnel in order to get to know the English way of family life. Similar facilities will be offered by Swiss precision engineering firms to British students.

The annual general meeting of the Gauge and Tool Makers' Association will be held on March 11 at the Savoy Hotel, London, W.C.2, immediately following the Association luncheon, when Lord Woolton will be the guest of honour.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Payon, 33, King Street, London, E.C.2—Engineers, etc. £1,000. F. Gaye.

Bromyhurst Engineering Company, 28, Queen Street, Manchester, 2—£3,000. E. and A. B. Ireland.

Wipac Mouldings, 1, Queen Victoria Street, London, E.C.4—£1,000. C. B. Jarman and E. Landon.

A. Farrington, 52, Heyrod Street, Ancoats, Manchester—Coppersmiths. £3.000. J. and A. Farrington.

Wortons (Tyseley), 58-60, Wharf Road, Tyseley, Birmingham, 11—Engineers, etc. £2,000. H. Worton.

Newcast Foundries, 271, Vicarage Farm Road, Heston, Mdx.—£6,000. W. H. Murray and P. Vinning.

Alldern Metal Products, Rear of 14, Albany Road, Coventry—£2,000. A. E. Withers, G. E. and P. F. Hood.

Spreadborough Engineering, Regent House, 89, Kingsway, London, W.C.2—£1,000. E. J. Spreadborough.

Harold Auger, Kent House, Telegraph Street, Moorgate, London, E.C.2—Engineers, etc. £1,000. H. Auger, W. W. Baldwin, and E. R. Budgen.

Blackwell Non-ferrous Foundry Company, Barracks Square, Queen Victoria Road, Coventry—£2,500. J. Blackwell, T. A. Adams, and W. E. Squires.

Alexander & M'Vean, 181, West Regent Street, Glasgow—Heating, ventilating, and electrical engineers. £3,000. W. M. Alexander and A. S. M'Vean.

Welldon Constructions, Strawberry Lane, Wednesfield—Constructional and general engineers, etc. £5,000. H. C. Davis, H. Downing, and W. Marsden.

PlasticOmatic, 17, Winchester Road, London, N.W.3—Manufacturers of machinery, tools, etc. £2,000. J. C. Tannock, G. Williams and F. G. Tarris.

Sandford Daley & Company, 50, St. Aubyn Street, Devonport, Plymouth—Manufacturers of dynamos, etc. £1,000. R. G. Sandford, B. J. and H. D. Daley.

Alfred S. Bartlett, 2, George's Road, Holloway Road, London, N.7—Metal frame manufacturers, etc. £2,000. A. S., C. F. and H. Bartlett, and F. W. Howes.

J. B. Jackson & Partners, 167-168, Millbank, Westminster, London, S.W.—Consulting engineers, etc. £10.000. J. B. Jackson, K. M. Blauhorn and W. T. Tenten.

James Chapman & Sons, Rye Works, Philip Road, Peckham, London, S.E.15—Washer and gasket manufacturers. £2,500. C. W. Meadows, A. F. and E. R. Chapman.

W. T. Seymour (Stockton)—Structural steel engineers, etc. £6,000. W. P. Seymour, Ewhurst, Bishopton Road, Stockton-on-Tees; R. Harrison, and G. Crompton.

Rushtons (Leeds), Olympia Works, Roundhay, Leeds, 8—Anodisers, metal finishers, etc. £2,000. E. W. Ditchburn, W. S. Martin, B. Workman and K. E. Shelley.

Hugh Martin & Sons (Carluke), Whiteshaw Engineering Works, Carluke—Mechanical and electrical engineers, etc. £12,000. W. and H. T. Martin and F. D. Christie.

S. Johnson (Rochdale), Penn Street, Rochdale—Founders, mechanical and electrical engineers, etc. £3,000. A. and H. Gaffiney, W. Brown, F. Wardle and F. Barber.

Morthan, 12a, Finsbury Square, London, E.C.2—Engineers, etc. £5,000. S. E. C. Bird, F. D. Blunt, F. Corp, S. J. Green, M. M. O. Irving, F. C. Morris and D. Roberts.

British Metallic Products, Brunswick House, 124, Tanners Hill, Deptford, London, S.E.8—£3,000. R. F. Gorbes, J. J. E. Collins, A. A. Brewer, T. A. French, and K. J. Jagger.

Tubeware & Allied Productions, 4, Station Parade, Victoria Road, Romford—Manufacturers of tubular and metal goods, etc. £2,000. E. Froggatt, J. Burton, and R. H. Daniel.

Aluminium Wire & Cable Company, Salisbury House, London, E.C.2—£500,000. G. Cunliffe, G. Boex, E. A. Reynolds, A. J. S. Aston, H. G. Herrington and H. Burroughes.

East Lancashire Textiles, Brookside Mill, Brookside Strect, Oswaldtwistle—Textile machinery and metal merchants, etc. £1,000. G. Bradbury, A. Woodhouse, F. Taylor, and C. Lloyd.

Lund Bros. & Company, 55, Bendon Valley, Earlsfield, London, S.W.18—Mechanical and general engineers, etc. £10,000. J. A. Roberts, C. Carter, J. S. Jordan, and A. C. Wright.

John Ferguson Associates, 218, Bishopsgate, London, E.C.2—Importers, exporters and manufacturers of engineering plant and equipment, etc. £5,000. J. Ferguson and W. Edwards.

Paterson Windermere (London)—Importers and exporters of shipbuilding materials, iron and steel castings, etc. £2,000. H. A. and M. T. Paterson, 63, Courtfield Gardens, London, S.W.5.

Home & Overseas Trading Company (U.K.), 127, Eastern Avenue, Ilford—Manufacturers, importers, exporters and shippers of machinery, etc. £2,000. N. S. Mars, R. H. Marks, V. Hogg and T. H Fischer.

D. & W. Instruments, 54a, Ripplevale Grove, London, N.1—Manufacturers of instruments and metallurgical work, etc. £1,000. H. H. Welfare. F. W., senr., F. W., junr., O. C., and H. A. Dixon and H. G. Ithell.

Braithwaite & Company, Egypt, The Moorings, Church Road, Gt. Booknam, Surrey—Constructional and mechanical engineers, etc. £50,000. J. H. Humphreys, R. J. N. Taylor, G. Parker and R. R. Anderson.

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HOLWELL
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SAND-LESS
MACHINE CAST
PIG IRON
THE STANTON IRONWORKS COMPANY
LIMITED
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NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"AGROX"—Spraying machinery. PLANT PROTECTION, LIMITED, Yalding, Kent.

"PRANA"—Die castings. SPARKLETS, LIMITED, Grosvenor House, Park Lane, London, W.1.

"JARU"—Bearings and machine couplings. JARU, LIMITED, River Plate House, Finsbury Circus, London, E.C.2.

"BEE PRODUCTS" AND BEE DEVICE—Water tanks, etc. W. B. BAWN & COMPANY, LIMITED, Byron Works, Blackhorse Lane, Walthamstow, London, E.17.

"PYRENE"—Fire-extinguishing apparatus and appliances, electric dust extractors, etc. PYRENE COMPANY, LIMITED, Great West Road, Brentford, Middx.

TRIANGULAR DEVICE—Metals and alloys, rails, chains, cables, etc. THOMAS BOLTON & SONS, LIMITED, Mersey Copper Works, Hutchinson Street, Widnes, Lancs.

"CANALLOY"—Installations and apparatus for lighting, heating, steam generating, etc. CANNON IRON FOUNDRIES, LIMITED, Deepfields, near Bilston, Staffs.

"PHOMENE"—Fire extinguishing apparatus and appliances, electric dust extractors, etc. PYRENE COMPANY, LIMITED, Great West Road, Brentford, Middx.

DEVICE—Agricultural and dairy machinery, air compressors, etc. W. B. BAWN & COMPANY, LIMITED, Byron Works, Blackhorse Lane, Walthamstow, London, E.17.

"M" (DEVICE)—Apparatus for controlling electric motors. MORECAMBE ELECTRICAL EQUIPMENT COMPANY, LIMITED, Westgate Works, Westgate, Morecambe, Lancs.

"B.B." (MONOGRAM DEVICE)—Chains and finished castings of malleable iron. BAGSHAWE & COMPANY, LIMITED, Dunstable Works, Church Street, Dunstable, Beds.

"MOLDEX"—Machine tools, drying machines, etc. AUTOMATIC SCALE COMPANY, LIMITED, Timperley Works, Manchester Road, Broadheath, Altrincham, Ches.

"MANCIBOND"—Moulding sand, binding material, moulding powder, and re-bonding material. COLIN STEWART, LIMITED, Wharton Lodge Works, Winsford, Ches.

"PROMAT KICKER"—Electroplating apparatus. POOR & COMPANY, c/o Haseltine, Lake & Company, 28, Southampton Buildings, Chancery Lane, London, W.C.2.

"EMELCA" and "TECADO"—Electric motors, electric current generators, etc. MAGNETOS LUCIFER, c/o George Ham & Company, 93-94, Chancery Lane, London, W.C.2.

"WINCHARGER"—Wind-driven motors, electric generators, etc. WINCHARGER CORPORATION, c/o Lloyd Wise & Company, 10, New Court, Lincoln's Inn, London, W.C.2.

"ALCOSA"—Blowpipes, non-electric soldering appliances, smiths' forge hand tools, etc. WILLIAM ALLDAY & COMPANY, LIMITED, 38A, Paradise Street, Birmingham, 1.

CHAIN LINK DEVICE—Goods included in Class 6, but not including chains or chain links. MORGAN CRUCIBLE COMPANY, LIMITED, Battersea Church Road, London, S.W.11.

"CARBLOX"—Shaped linings being parts of hand implements for foundry ladles and for casting ladles, etc. CARBLOX, LIMITED, Storrs Bridge, Loxley, Sheffield, 6.

CIRCULAR DEVICE—Internal combustion engines, compressors, etc. JOHN FOWLER & COMPANY (LEEDS), LIMITED, Steam Plough Works, Leathley Road, Hunslet, Leeds, 10.

"PORCENELL"—Vitreous enamel coatings for metal surfaces. POOR & COMPANY, c/o Haseltine, Lake & Company, 28, Southampton Buildings, Chancery Lane, London, W.C.2.

"GLISSITE"—Anti-friction compositions of pressed and sintered metal powders, driving pulleys, etc. AKTIEBOLAGET PULVERKEMI, c/o Frank Watson, Aldwych, London, W.C.2.

"THREE RAVENS" (DEVICE)—Metals and their alloys, rails, etc. ARTHUR E. EVANS & COMPANY, LIMITED, Westminster Bank Chambers, North Street, Bishops Stortford, Herts.

"BURNEAT" AND "FAYNEAT"—Gas and electrical cooking apparatus and appliances, and water heaters. NEAT GAS APPLIANCES, LIMITED, 31-35, Belle Vue Road, Hendon, N.W.4.

"HYDRO-MOTIC" — Hydraulical power-transmission gear, pumps and machinery. B. & P. SWIFT, LIMITED, Swift Works, North Circular Road, West Twyford, London, N.W.10.

"MONITOR"—Pneumatic and hydraulic presses, air compressors, etc. "MONITOR," PATENT SAFETY DEVICES, LIMITED, "Monitor" Works, Kings Road, Wallsend-on-Tyne.

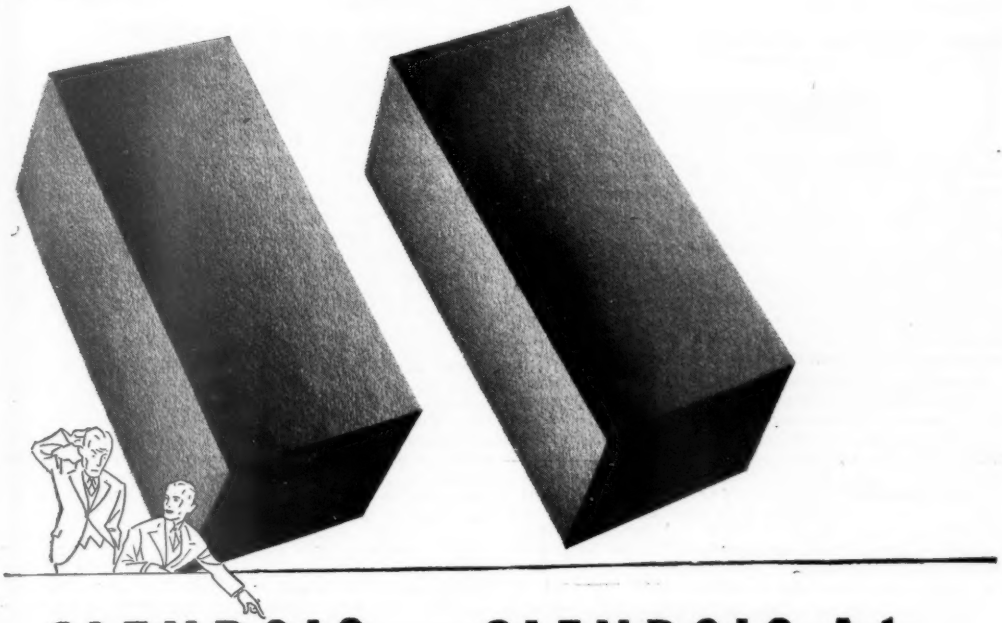
CONTRACTS OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Cheltenham, January 31—Wrought iron and steel, for the Borough Council. Mr. G. Marsland, borough and water engineer, Municipal Offices, Cheltenham.

Ilford, February 3—Iron castings, etc., for the Borough Council. Mr. L. E. J. Reynolds, borough engineer and surveyor, Town Hall, Ilford. (Fee 1s., non-returnable.)

Tyldesley, February 6—Cast-iron manhole covers and frames, and street gullies, etc., for the Urban District Council. The Engineer and Surveyor, Town Hall, Tyldesley.



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IN most structures provision is made for a very high factor of safety. With firebrick structures, however, modern furnace operating temperatures are so near to the actual fusion temperature of the firebrick that only a slight safety margin is obtainable. Further, the loads to be carried by the firebricks must be considered in conjunction with the temperature and *conditions* to which they will be subjected. To assist users faced with problems concerning the selection of firebricks, a temperature gradient chart for the rapid estimation of heat losses through furnace walls is available on request. The Glenboig technical staff are pleased to make specific recommendations. Generally speaking, in high temperature furnaces the use of "Glenboig A.I." quality firebricks gives a greater margin of safety.

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EXPORT AGENTS: GENERAL REFRACTORIES LTD., GENEFAX HOUSE, SHEFFIELD 10

Raw Material Markets

IRON AND STEEL

Particular care has to be exercised in the distribution of pig-iron supplies, as there are no extensive stocks and demands are increasing steadily. In the case of high-phosphorus iron for the light-castings industry, stocks are at a very low level, and the present output, largely from Northamptonshire and Derbyshire, is only keeping pace with current consumption. When more labour is available at the foundries, additional supplies of iron will certainly be required, and it will present the Control with a difficult problem. Supplies of the better grades of pig-iron for the general engineering and jobbing foundries are rather better, but they are by no means plentiful.

Considerable supplies of scrap are necessary to meet the foundries' requirements. Deliveries so far have been reasonably satisfactory, but the light foundries are wanting larger supplies of light and medium cast scrap and big tonnages of heavy cast iron, while suitable steel scrap is needed in considerable quantities by the engineering foundries. The shortage of wagons and railway restrictions are still impeding the flow of deliveries of coke, stocks of which at consuming points are low. Consumers have no difficulty in getting ganister and limestone, while the position of ferro-alloys for the engineering foundries is satisfactory.

There cannot be any easing of the situation in regard to billets for some time to come, as it has not been possible for the Control to buy any appreciable tonnages of semis from abroad. Small quantities have been purchased, but there is need for heavy imports, as the home makers cannot supply anything like the tonnage needed to keep the re-rollers in full operation. The latter have very heavy order-books, but full outputs are not being achieved because of the paucity in supplies of semis. The sheet makers, who are also heavily committed, are receiving slightly improved supplies of sheet bars, but there is no surplus. Defective sheet bars are accepted as they become available, but stocks are virtually exhausted. The re-rollers of bars, etc., are keen to get any supplies of defective billets, crops and the like. Some of the re-rollers have been able to acquire recently supplies of electrically melted billets, but the quantities are not heavy.

While all the steel mills have heavy rolling programmes, the congestion of orders is conspicuous at the sheet and plate mills. Regular consumers are getting their usual quotas, but Government departments dictate the destination of every consignment and rollers are consequently unable to accord special consideration to old and valued customers. Bookings for heavy joists and all sizes of sections are far heavier than they have been since the outbreak of war. Home and foreign demand for railway equipment is far in excess of capacity and extensive as is the present demand for colliery arches, roofing bars and props, a further permanent expansion in the use of steel in the pits is foreseen.

NON-FERROUS METALS

Following discussions between the Ministry of Supply and trade representatives, the licensing restrictions for copper and zinc have been modified. It will still be necessary for firms applying for licences for copper to certify that the metal is needed to cover orders and that full allowance has been made for scrap intake. The total tonnage of unwrought copper, which any firm is permitted to hold (including their stocks and forward purchases), has been increased to seven (instead of six) months' consumption at its average monthly rate of consumption in September and October, 1946. Firms whose current consumption exceeds by 10 per cent. or more their consumption in the basic period (September and October, 1946) may apply to be assessed on the higher basis.

In order that firms whose total holdings of copper exceed seven months' consumption may continue to book orders, the reduction of their position to seven months may now be effected more gradually; from February 1 they may apply for licences to acquire for any calendar month a tonnage equivalent to 90 per cent. of their monthly consumption in the basic period. For the remainder of January the permitted tonnage in such cases will be 30 per cent. In future all applications to the Directorate of Non-ferrous Metals for licences to acquire copper must be accompanied by a purchase order. Contracts will then be issued as in the past. This means that where the copper is supplied by the Directorate, licences will no longer have any period of validity. Where the Directorate is not to be the supplier the licences will have a validity of seven days.

The same provisions as for copper apply to the licensing procedure for zinc, with the exception that the total holding of unwrought zinc must not exceed six months' consumption at the basic monthly rate.

The Ministry of Supply has announced that the buying price of tin from Malaya and Nigeria will remain unchanged until further notice. Malayan tin will therefore continue to be bought at £370 a ton at smelters' works Penang and Singapore, and Nigerian tin at £357 10s. a ton of tin in ore, f.o.b. Nigerian ports.

It is reported that the tin smelter of the Billiton concern at Arnhem, the Hollandsche Metallurgische Bedryven, has now practically been repaired, and is working an important part of the Billiton tin output, which is steadily increasing. Production is approaching 50 per cent. of the 1939 level.

PRODUCTION CENSUS PROTEST

The Engineering Industries Association is getting in touch with kindred bodies to protest against the requirements of the Board of Trade under the Partial Census of Production. The secretary-general of the association said recently that large firms would have to employ several accountants in an endeavour to compile intelligently the information required—that was without resource to guess work, but small firms could neither afford accountant's fees nor the time necessary. Some of the information asked for was never normally kept by engineering firms.